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Relationship Between Marketing Category (Count) Composition and Ex-Vessel Value of Reported Annual Catches of Shrimp in the Eastern Gulf of Mexico

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Introduction

Caillouet and Patella (1978) showed how marketing category (count=number of shrimp per pound, heads-off) composition of the reported annual catches of brown shrimp, *Penaeus aztecus*, and white shrimp, *P. setiferus*, influenced the value of these catches from two Gulf states, Texas and Louisiana, which have different shrimp laws (Christmas and Etzold, 1977) and shrimp harvesting strategies. In Texas, the catch of small shrimp is greatly restricted, but in Louisiana there are large catches of small shrimp. Consequently, for a given weight of catch, the ex-vessel value of white and brown shrimp harvested at larger sizes in Texas was 1.2 and 1.6 times higher, respectively, than that of white and brown shrimp harvested at smaller sizes in Louisiana. This paper extends the analysis to the shrimp fisheries of the eastern Gulf of Mexico, namely

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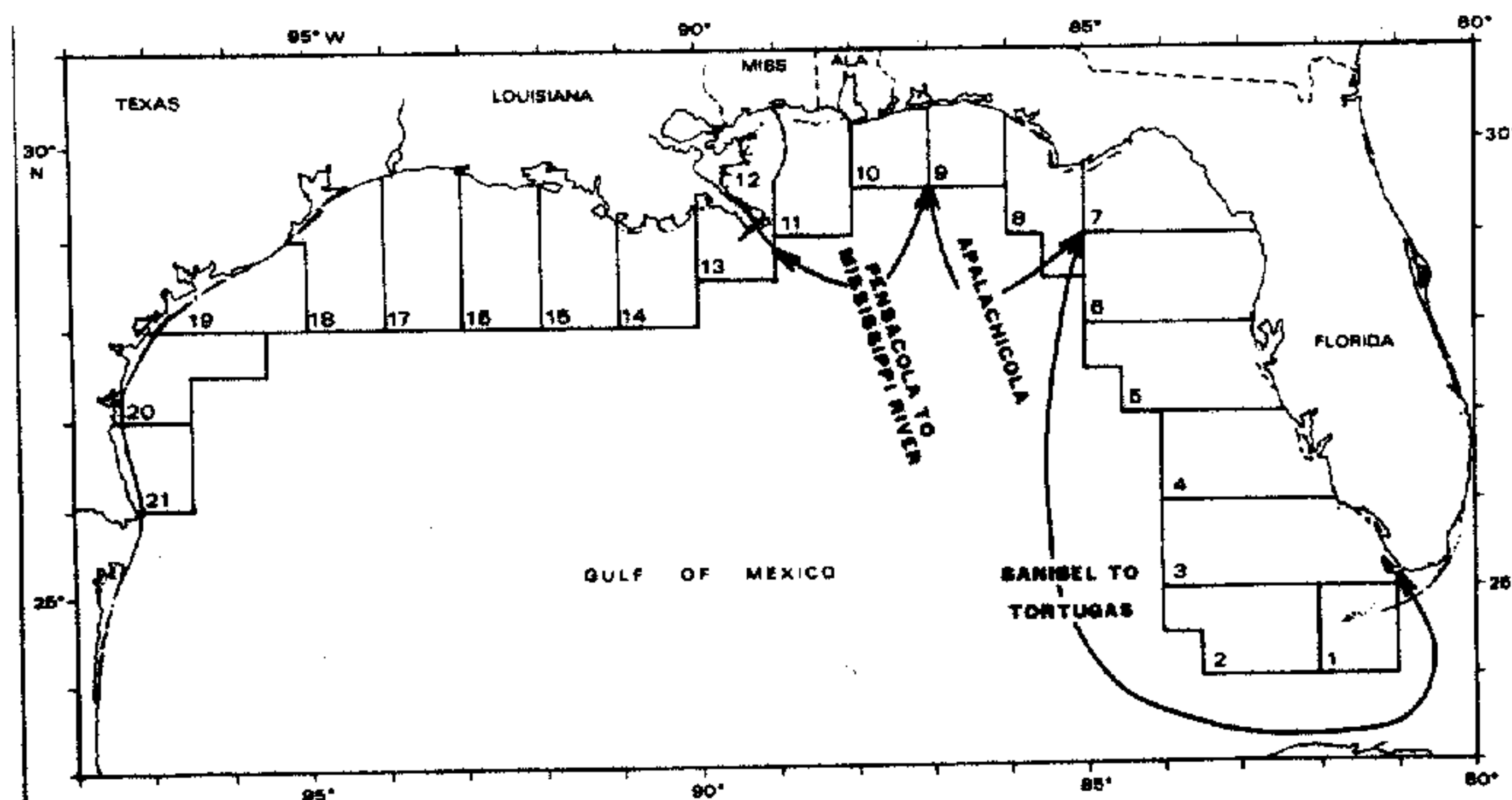
those of Mississippi, Alabama, and west coast of Florida, and includes pink shrimp, *P. duorarum*, as well as brown and white shrimp. In this paper, harvesting strategy refers to the sizes of shrimp harvested, retained, and landed.

Brief Description of Fisheries and Data

Shrimp fisheries of the eastern Gulf of Mexico are divided into three major statistical regions (Fig. 1): Pensacola to Mississippi River (statistical areas 10-12), Apalachicola (statistical areas 7-9), and Sanibel to Tortugas (statistical areas 1-6). These regions encompass that part of the Louisiana coast east of the Mississippi River, the coasts of Mississippi and Alabama, and the west coast of Florida. Only the dominant species in each of these three regions are considered herein. Pink

ABSTRACT—The effect on ex-vessel value of marketing category (count=number of shrimp per pound, heads-off) composition of reported annual catches of brown shrimp, *Penaeus aztecus*, white shrimp, *P. setiferus*, and pink shrimp, *P. duorarum*, in the eastern Gulf of Mexico. Shrimp management implications are discussed.

Figure 1.—Statistical areas used in reporting Gulf Coast shrimp data.



shrimp is the dominant species in reported catches from the Apalachicola and Sanibel to Tortugas regions, and brown and white shrimp dominate the reported catches in the Pensacola to Mississippi River region (Fig. 2). The Apalachicola region appears to be a zone of transition from brown and white to pink shrimp.

Brown, white, and pink shrimp spend the juvenile and subadult phases of their life cycles in inshore waters and the adult and larval phases in offshore waters (Fig. 3). They are first exploited by the inshore fisheries, then those that

survive emigrate from the estuaries and become vulnerable to the offshore fisheries.

Numbers of shrimp vessels (5 net registry tons and larger, Fig. 4) and their average size (net registry tons, Fig. 5) have increased gradually in Mississippi, Alabama, and Florida.

Numbers of shrimp boats (less than 5 net registry tons, Fig. 6) have remained relatively constant in Alabama and Florida but have increased in Mississippi. The number of vessels is higher in Florida than in Alabama and Mississippi (Fig. 4), and Alabama and Florida vessels average larger than those of

Figure 3. Relationship among inshore and offshore shrimp fisheries and estuarine and oceanic phases of brown, white, and pink shrimp life cycles.

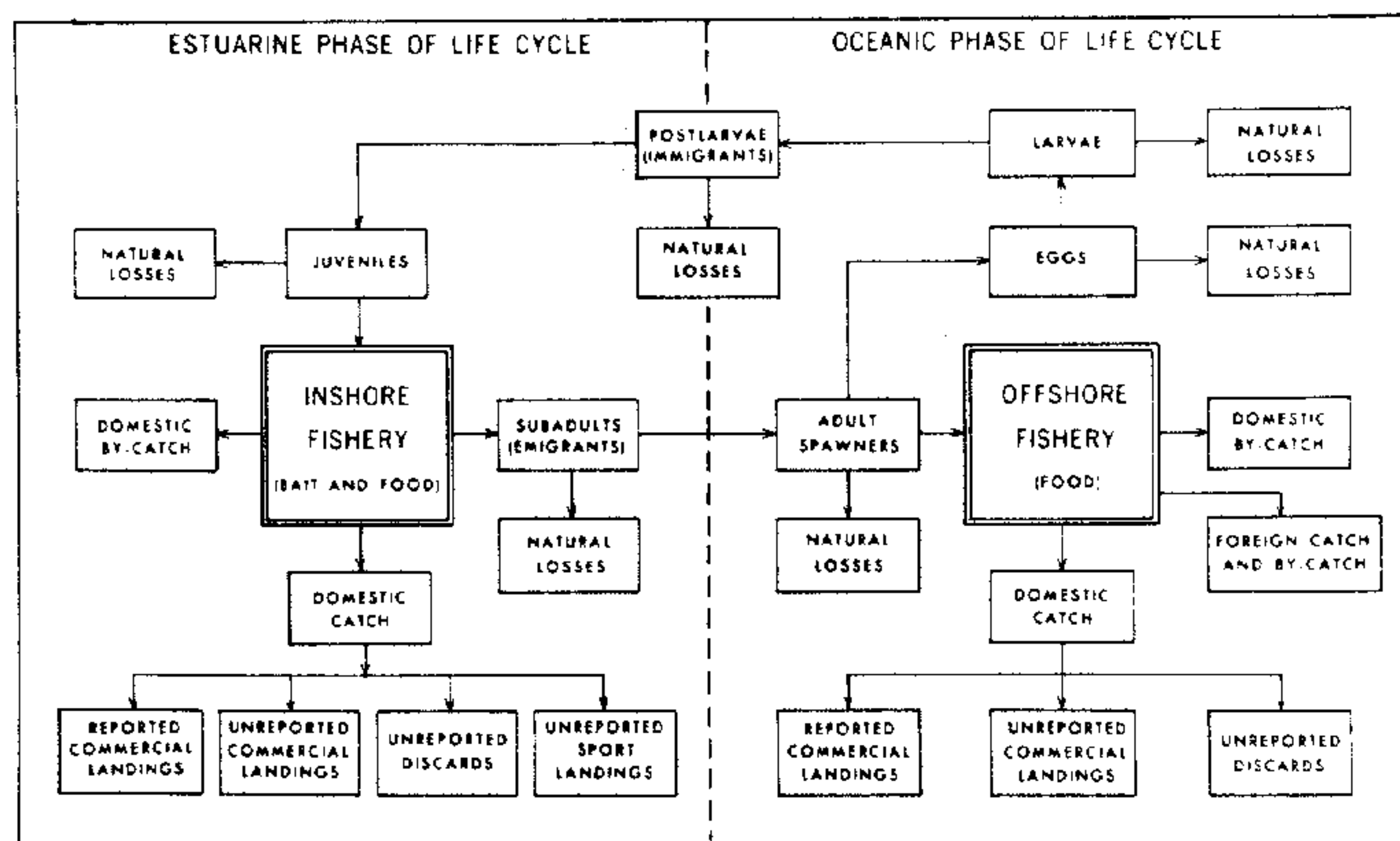


Figure 2. Species composition (percent by weight, heads-off) of reported annual catches of shrimp from Pensacola to Mississippi River (statistical areas 10-12), Apalachicola (statistical areas 7-9), and Sanibel to Tortugas (statistical areas 1-6) regions, 1959-75.

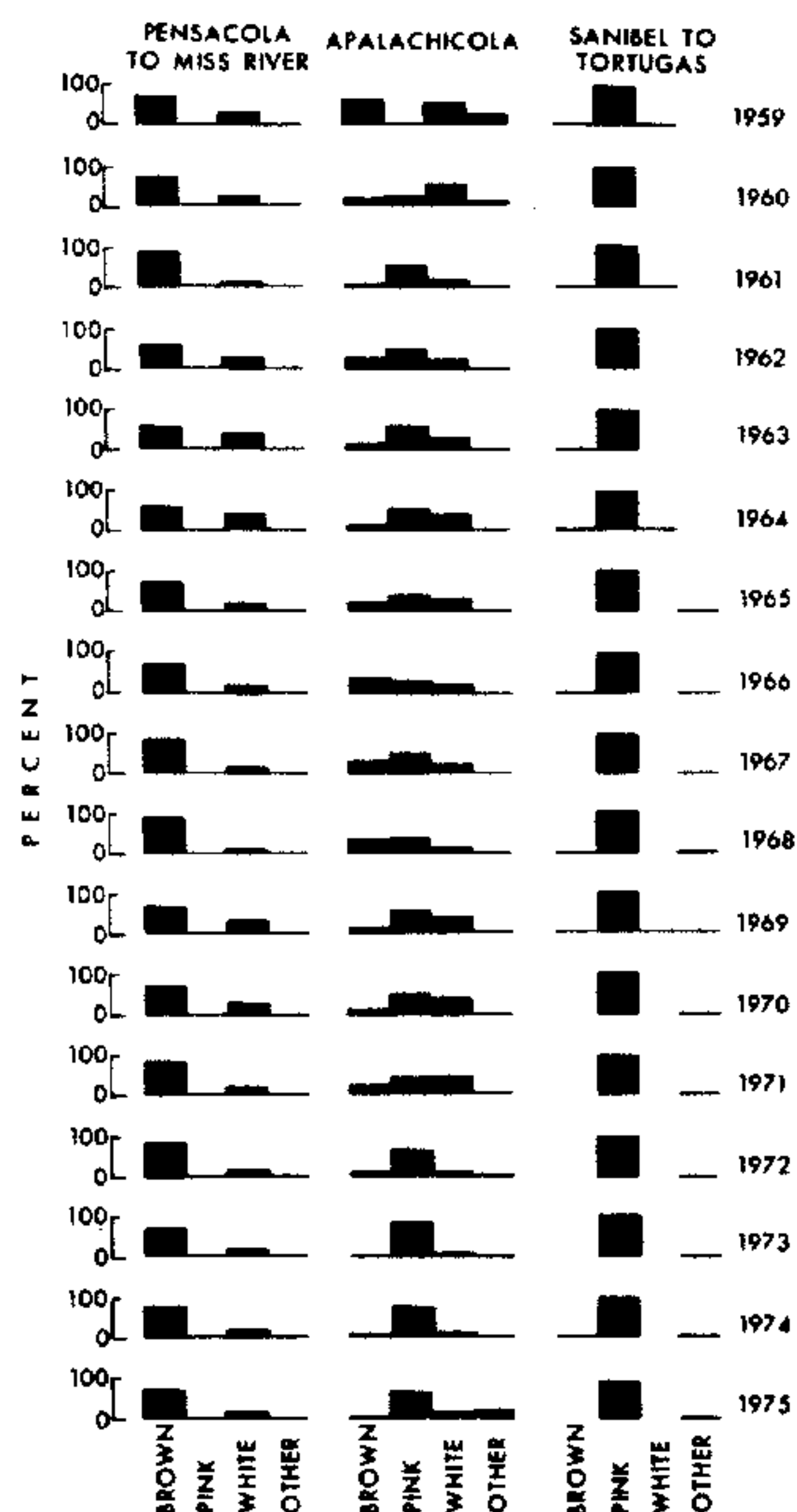
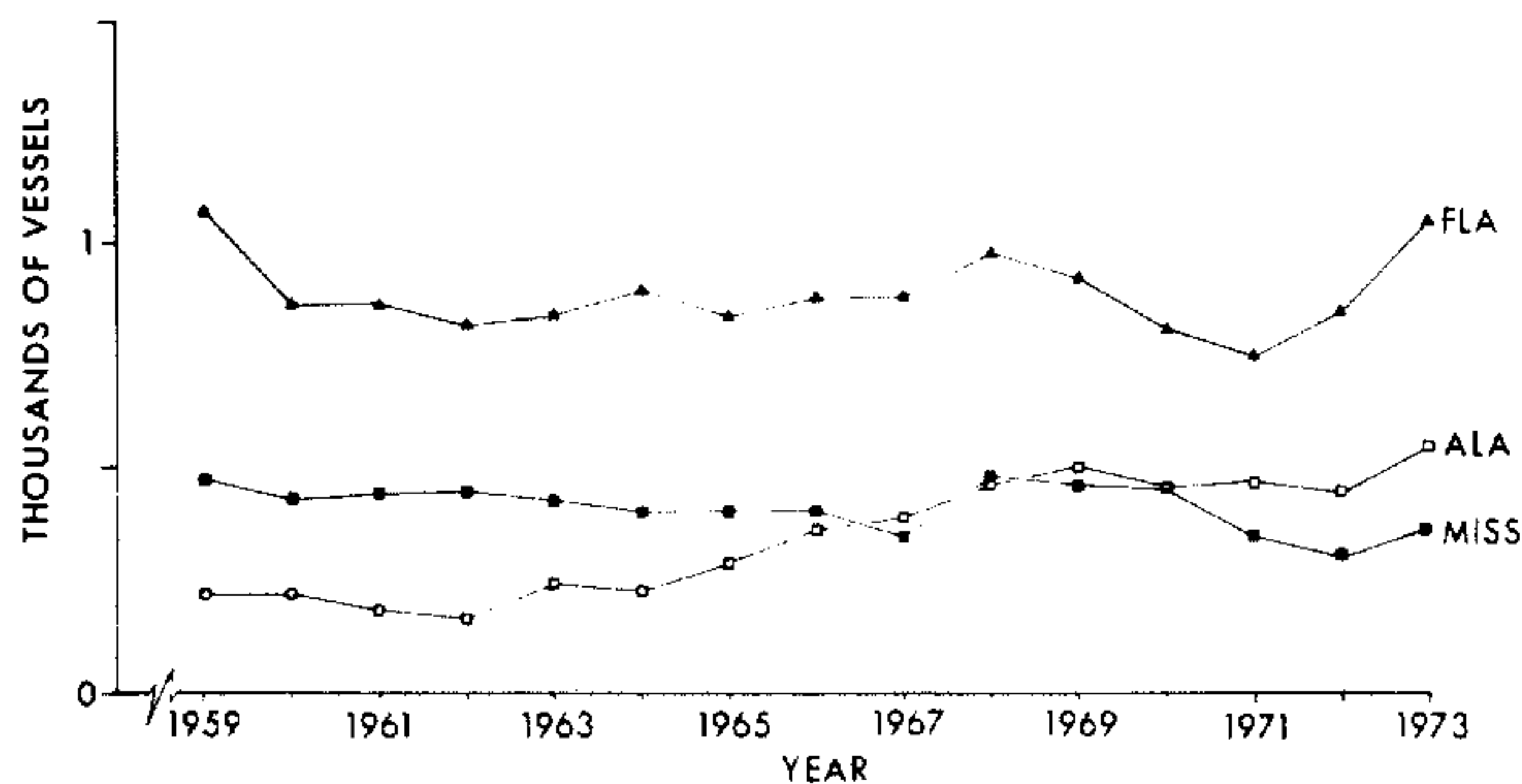


Figure 4. Reported annual number (thousands) of shrimp vessels (5 net registry tons or larger) in Mississippi, Alabama, and Florida west coast, 1959-73.



Mississippi (Fig. 5). Numbers of fishermen operating from vessels have increased in Florida and Alabama but have declined somewhat in Mississippi (Fig. 7), whereas Mississippi has larger numbers of fishermen operating from boats than either Alabama or Florida. The results of these differences and trends in characteristics of the fisheries, as well as differences in state laws and harvesting strategies, also are reflected in the count composition of the reported annual catches in the Pensacola to Mississippi River, Apalachicola, and Sanibel to Tortugas regions (Fig. 8-11).

Data and Methods

This paper deals with reported annual catches of shrimp during 1959-75, the years for which annual summaries of the Gulf Coast shrimp data (National Marine Fisheries Service, 1960-76) were available. Combined inshore and offshore catches were used. They represent catches landed by U.S. craft at U.S. ports along the coast of the Gulf of Mexico. The reported catches represent only a portion of the total annual catches, since some of the commercial landings (including those of foreign craft),

discarded undersized shrimp, and landings by sport fishermen are not adequately sampled and therefore are not reported (Fig. 3). The proportion of the total annual catch that is not reported is unknown, but we believe that the count composition of the reported catch is a reasonably good reflection of shrimp population characteristics and harvesting strategy combined. We used annual summaries of reported catch in pounds (heads-off) within eight marketing or count categories (number of shrimp per pound, heads-off: ≥ 68 , 51-67, 41-50, 31-40, 26-30, 21-25, 15-20, and < 15) from the Gulf Coast shrimp data.

To illustrate the effect of count composition on ex-vessel value of reported catches of brown, white, and pink shrimp, average value per pound (heads-off) was calculated for each species from annual total dollars and pounds by size category (for the entire U.S. Gulf Coast) as reported in National Marine Fisheries Service (1976). These averages were multiplied by reported annual catches in each count category, species, and region to estimate annual value (in 1975 units) of the catches by count category, species, and region. Summation over count categories estimated total annual ex-vessel value (in 1975 units) of the catches by species and region. Though 1975 units were used because data were available, similar methods could be applied as more recent statistics become available. Linear regression lines were fitted to the data points and through the origin for each species and region to estimate average ex-vessel value per pound (the slope of the line).

Results and Discussion

In the Pensacola to Mississippi River region (Fig. 8), count composition of reported catches of brown shrimp has remained relatively stable, but that of white shrimp has fluctuated somewhat (Fig. 9). Count composition of reported catches of pink shrimp has remained relatively stable in the Sanibel to Tortugas region (Fig. 11) but has fluctuated somewhat in the Apalachicola region (Fig. 10).

Figure 5.—Annual average reported registry tons per shrimp vessel (5 net registry tons or larger) in Mississippi, Alabama, and Florida west coast, 1960-73.

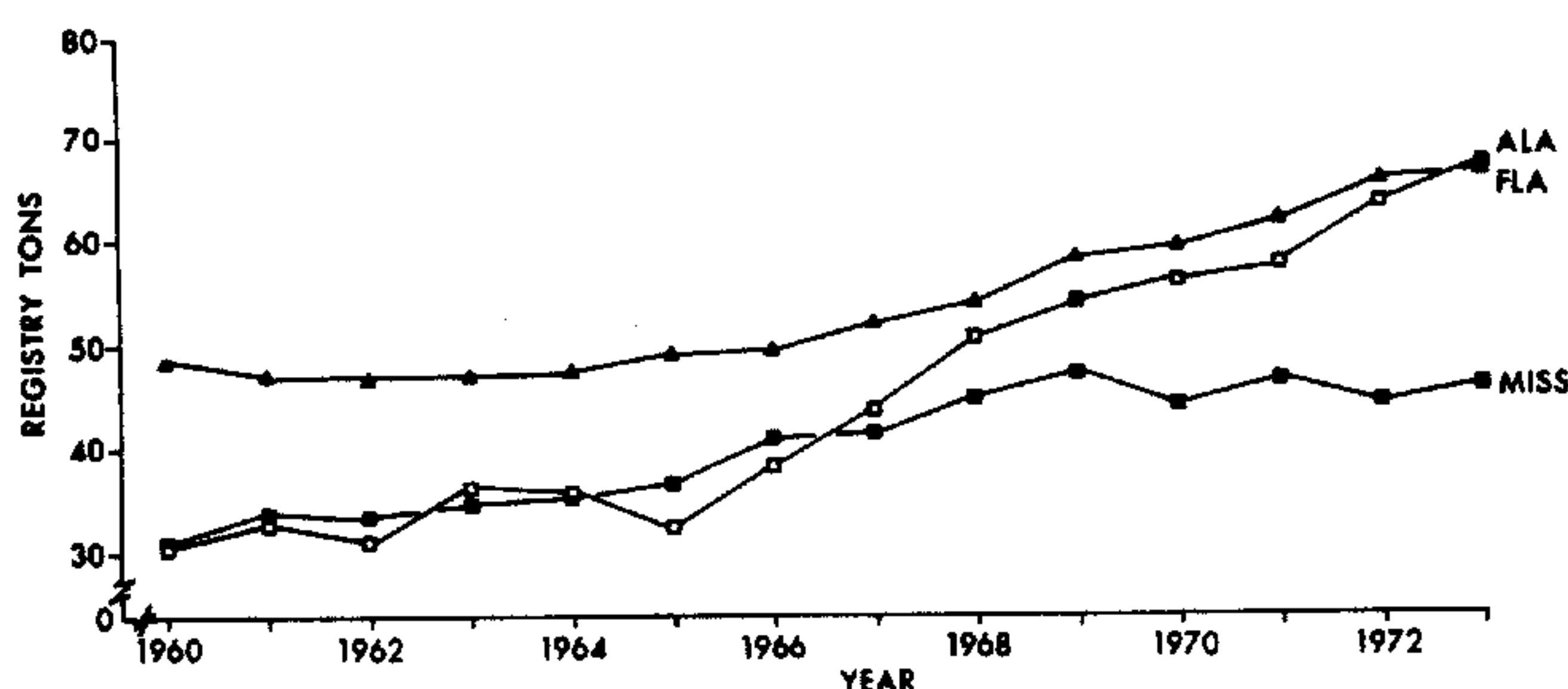
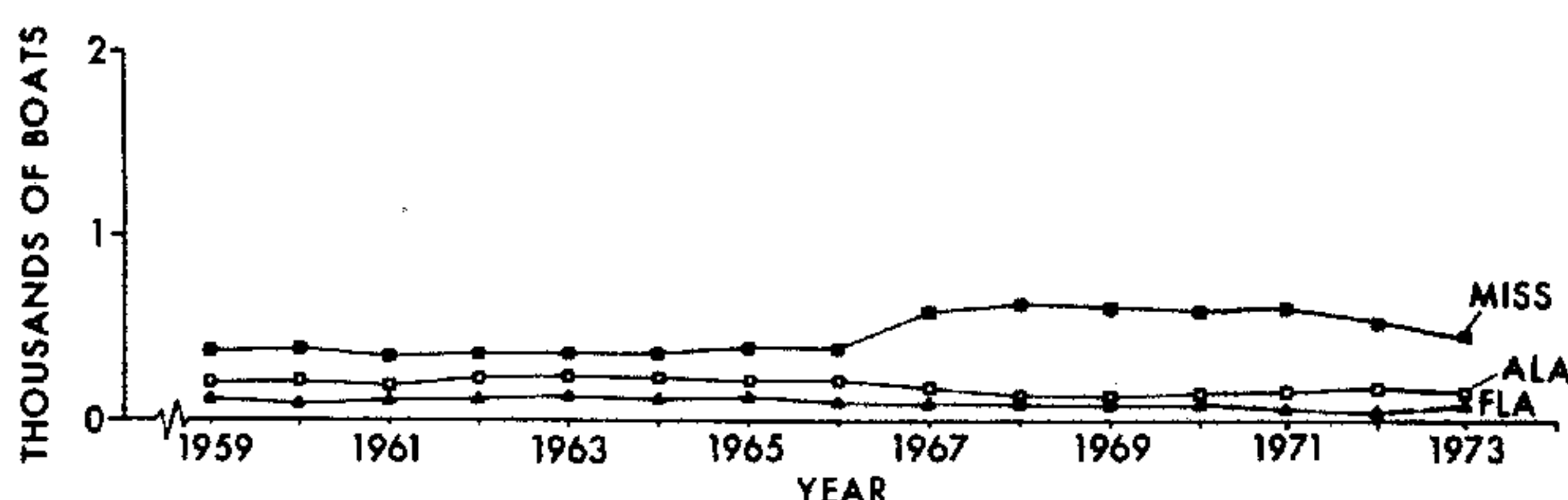


Figure 6.—Reported annual number (thousands) of shrimp boats (less than 5 net registry tons) in Mississippi, Alabama, and Florida west coast, 1959-73.



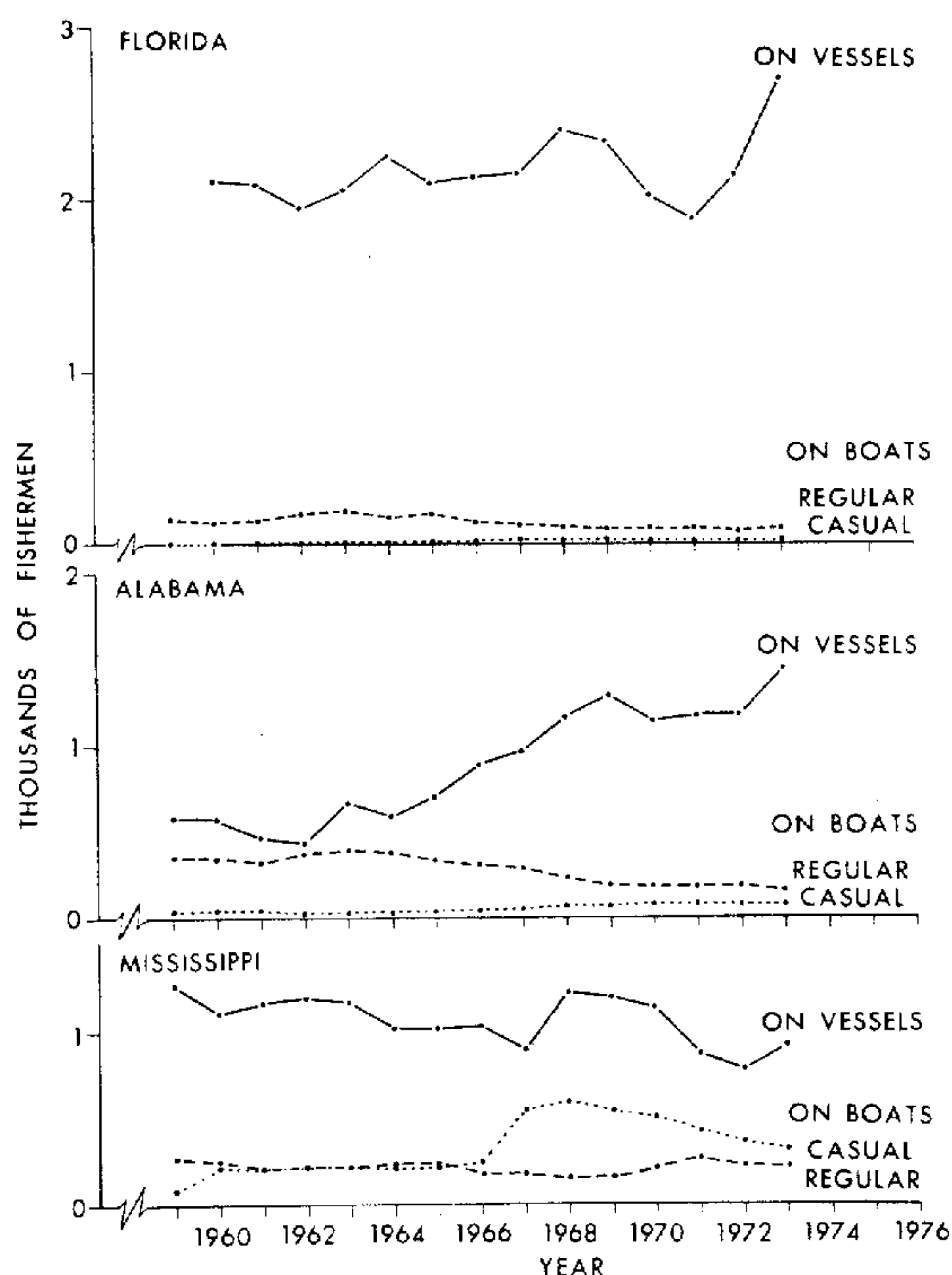


Figure 7.—Reported annual number (thousands) of fishermen who shrimped on vessels (5 net registry tons or larger) and boats (less than 5 net registry tons) in Mississippi, Alabama, and Florida west coast, 1959-73.

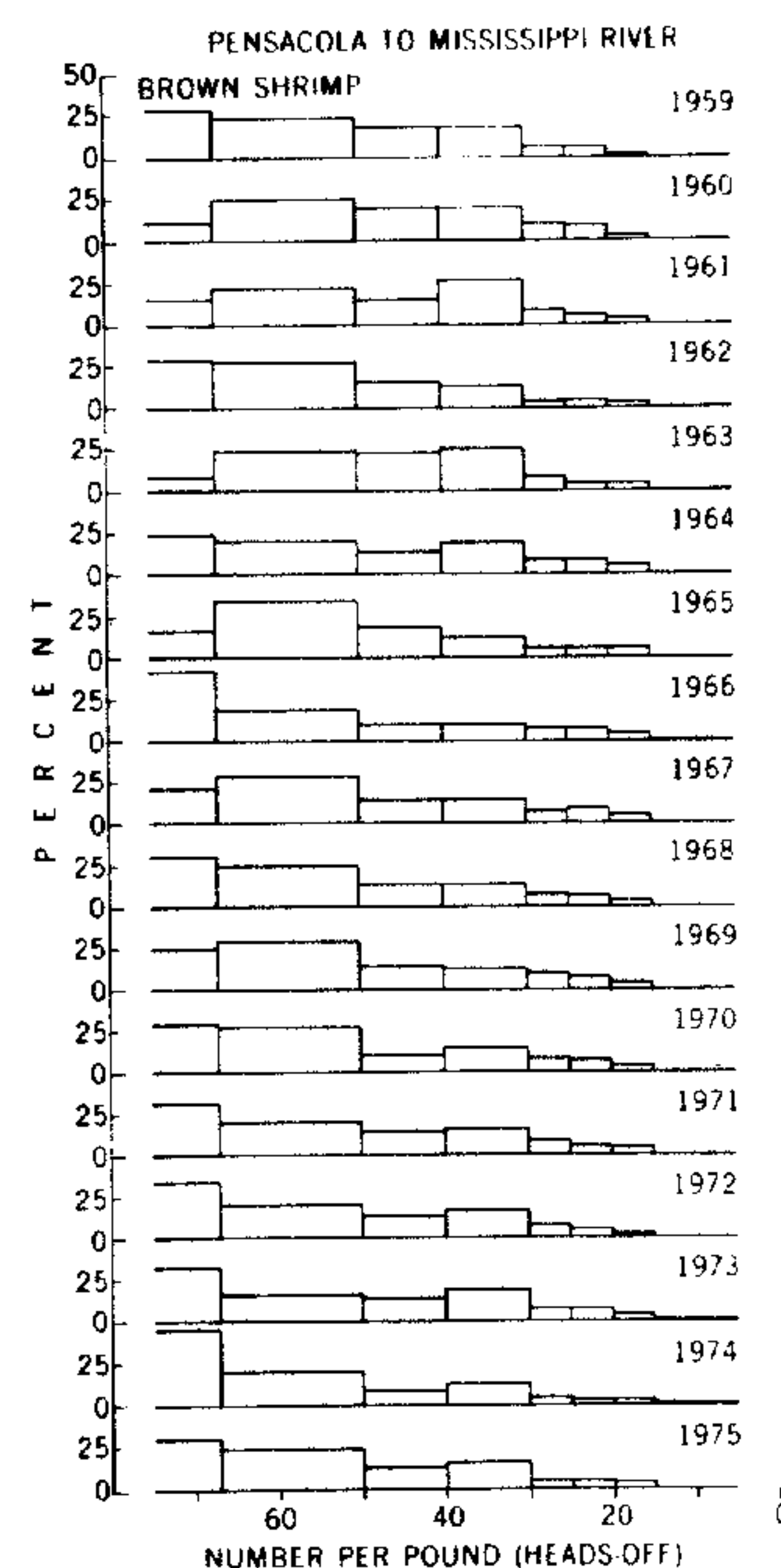


Figure 8.—Count (number per pound, heads-off) composition (percent by weight) of reported annual catches of brown shrimp from the Pensacola to Mississippi River region (statistical areas 10-12), 1959-75.

Estimated ex-vessel value of the reported annual catches is plotted against weight of the catches in Figures 12-15. The points fell remarkably close to the fitted lines, as was the case for brown and white shrimp in the Texas coast and Mississippi River to Texas regions (Caillouet and Patella, 1978). The estimated average ex-vessel values are given in Table 1 along with those from Caillouet and Patella for comparison.

Because they were harvested at

larger sizes, brown shrimp in the Texas coast region had the highest estimated

average ex-vessel value of \$2.22 per pound (in 1975 units). This was

Table 1.—Estimated average ex-vessel value per pound (heads-off, in 1975 units) of brown, white, and pink shrimp from five Gulf Coast States regions, 1959-75.

Region	Brown shrimp (dollars/pound)	White shrimp (dollars/pound)	Pink shrimp (dollars/pound)
Texas coast ¹	2.22	2.07	—
Mississippi River to Texas ¹	1.36	1.75	—
Pensacola to Mississippi River	1.55	1.97	—
Apalachicola	—	—	1.52
Sanibel to Tortugas	—	—	1.56

¹Adapted from Caillouet and Patella (1978.)

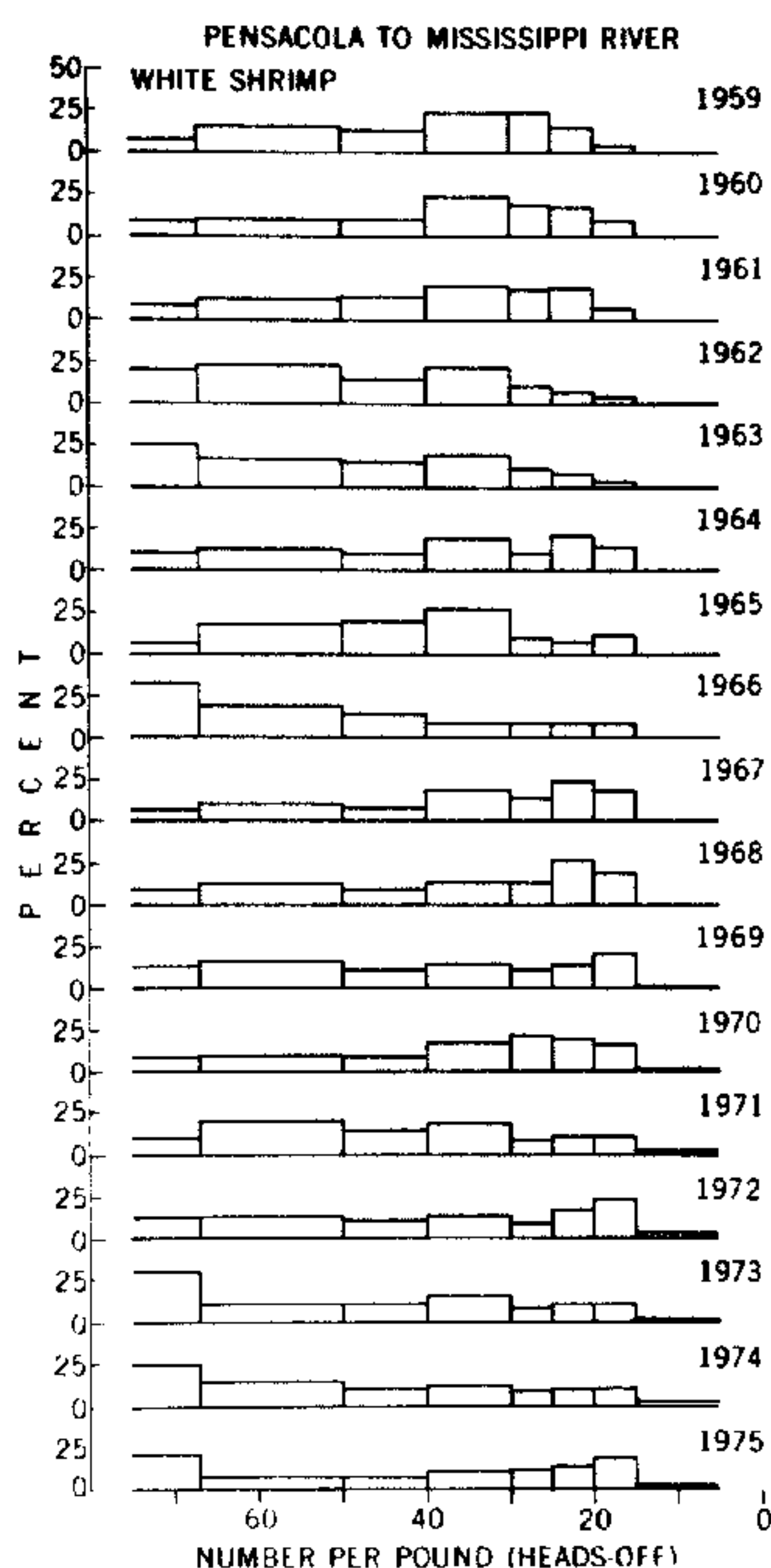


Figure 9.—Count (number per pound, heads-off) composition (percent by weight) of reported annual catches of white shrimp from the Pensacola to Mississippi River region (statistical areas 10-12), 1959-75.

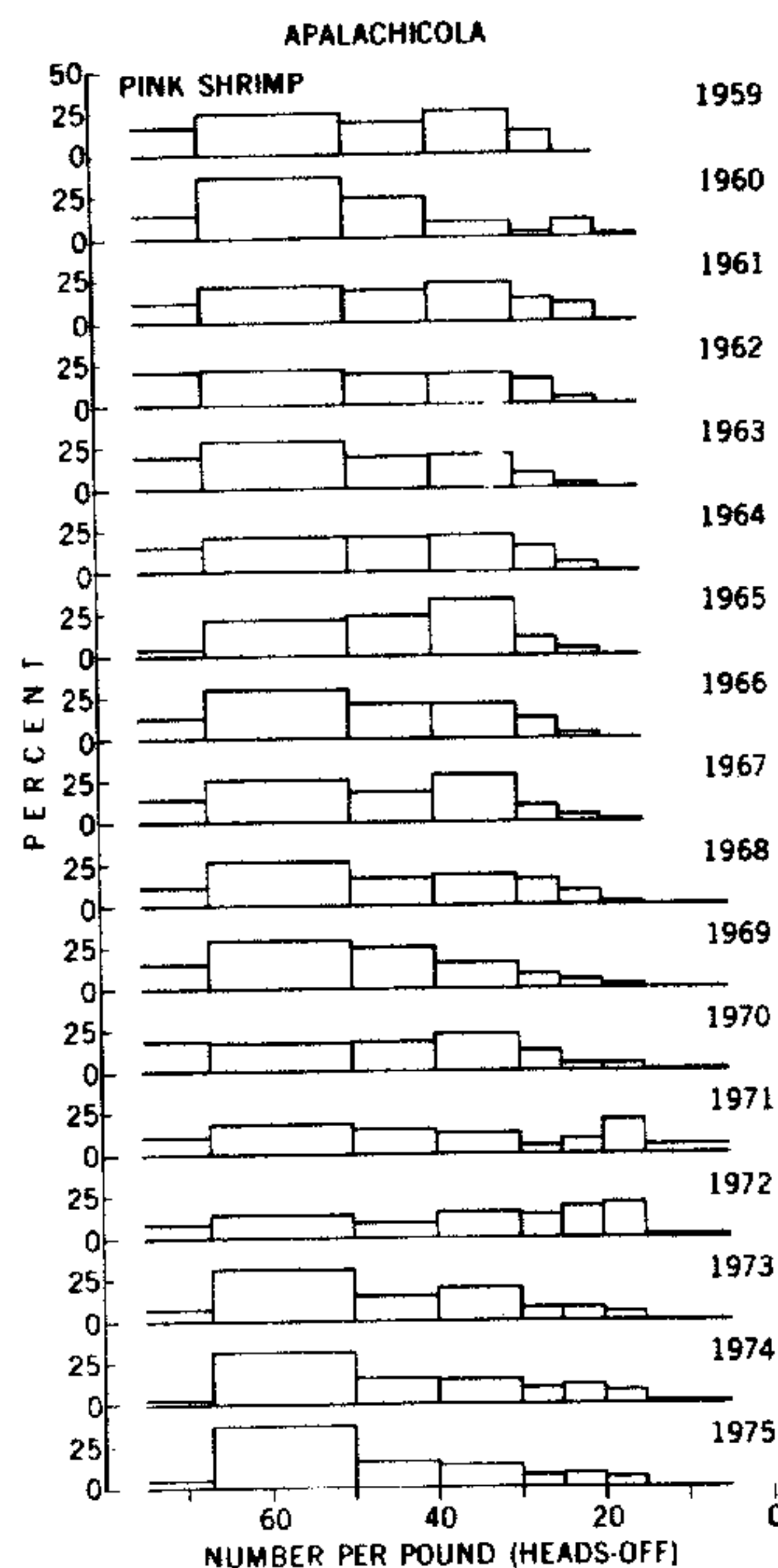


Figure 10. Count (number per pound, heads-off) composition (percent by weight) of reported annual catches of pink shrimp from the Apalachicola region (statistical areas 7-9), 1959-75.

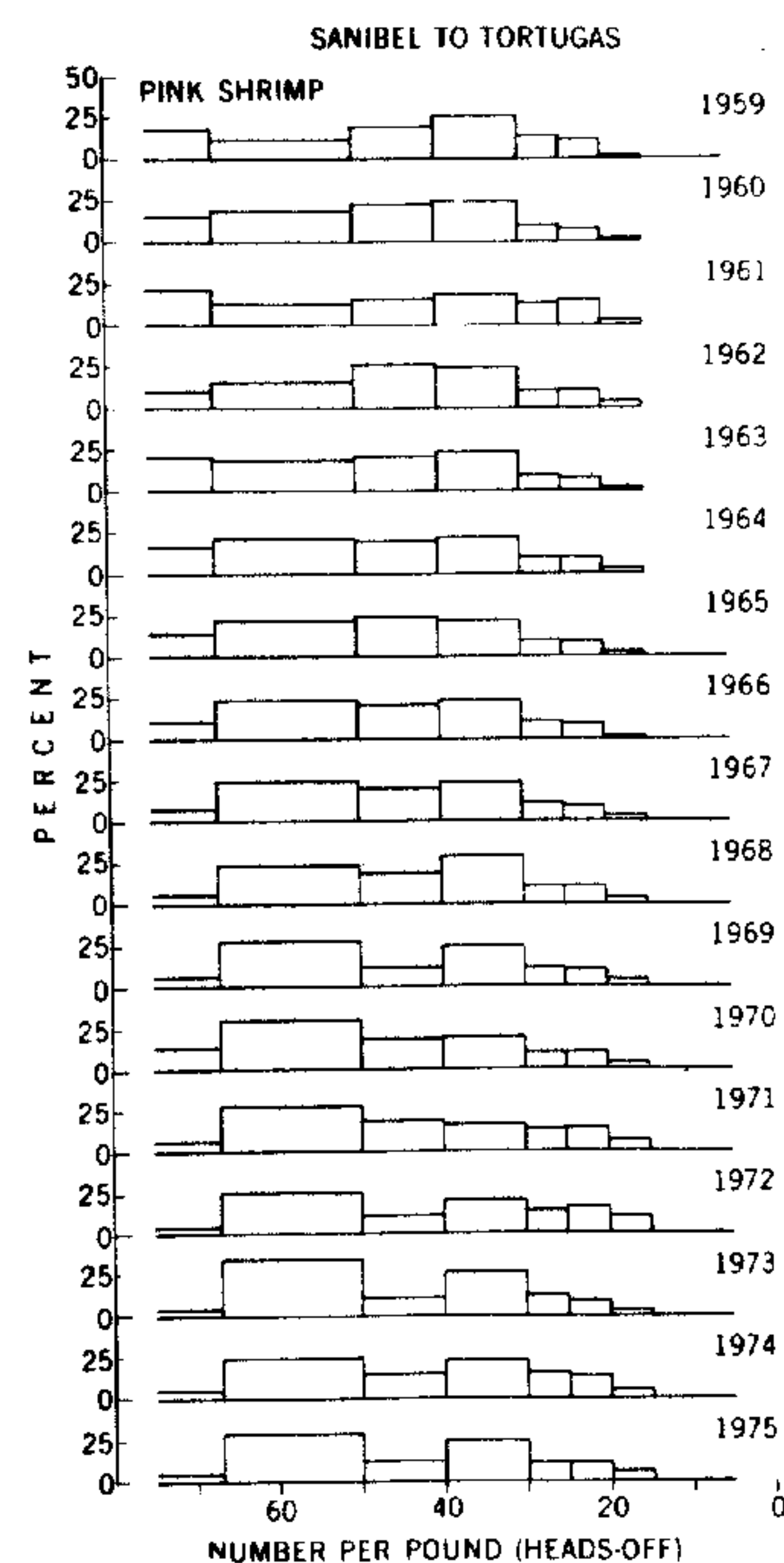


Figure 11.—Count (number per pound, heads-off) composition (percent by weight) of reported annual catches of pink shrimp from the Sanibel to Tortugas region (statistical areas 1-6), 1959-75.

followed, in descending order, by white shrimp in the Texas coast (\$2.07), Pensacola to Mississippi River (\$1.97), and Mississippi River to Texas (\$1.75) regions. Brown shrimp in the Pensacola to Mississippi River region (\$1.55) and pink shrimp in Apalachicola (\$1.52) and Sanibel to Tortugas (\$1.56) were close in estimated average ex-vessel value. The lowest estimated average ex-vessel value (\$1.36) was obtained from brown shrimp in the Mississippi River to Texas region.

Management Implications

This paper and that of Caillouet and Patella (1978) use the relationship

between estimated ex-vessel value of reported annual shrimp catches and weight of these catches to show the effects of regional differences in count composition of these catches, a function of differences in shrimp laws and harvesting strategy. It seems clear that the strategy of harvest of large proportions of larger shrimp in Texas increases both the weight and ex-vessel value of these catches. Social impacts and economic inputs beyond the ex-vessel level also require consideration in studies of effects of harvesting strategy.

The relationship between estimated ex-vessel value and weight of reported annual catches of a given species in a given region holds remarkably well

over a wide range of fluctuations in reported annual catches. In fisheries, such as shrimp fisheries of the Gulf of Mexico, in which wide fluctuations occur in annual yield in response to fluctuations in recruitment, the best that can be done is to make the best use of whatever recruitment occurs (Gulland and Boerema, 1973). This lends support to the concept of management of shrimp fisheries by minimum size limits or other approaches which regulate the size of shrimp at first harvest, i.e., closed areas or seasons. These approaches to management have been widely used in shrimp fisheries of the Gulf of Mexico (Christmas and Etzold, 1977).

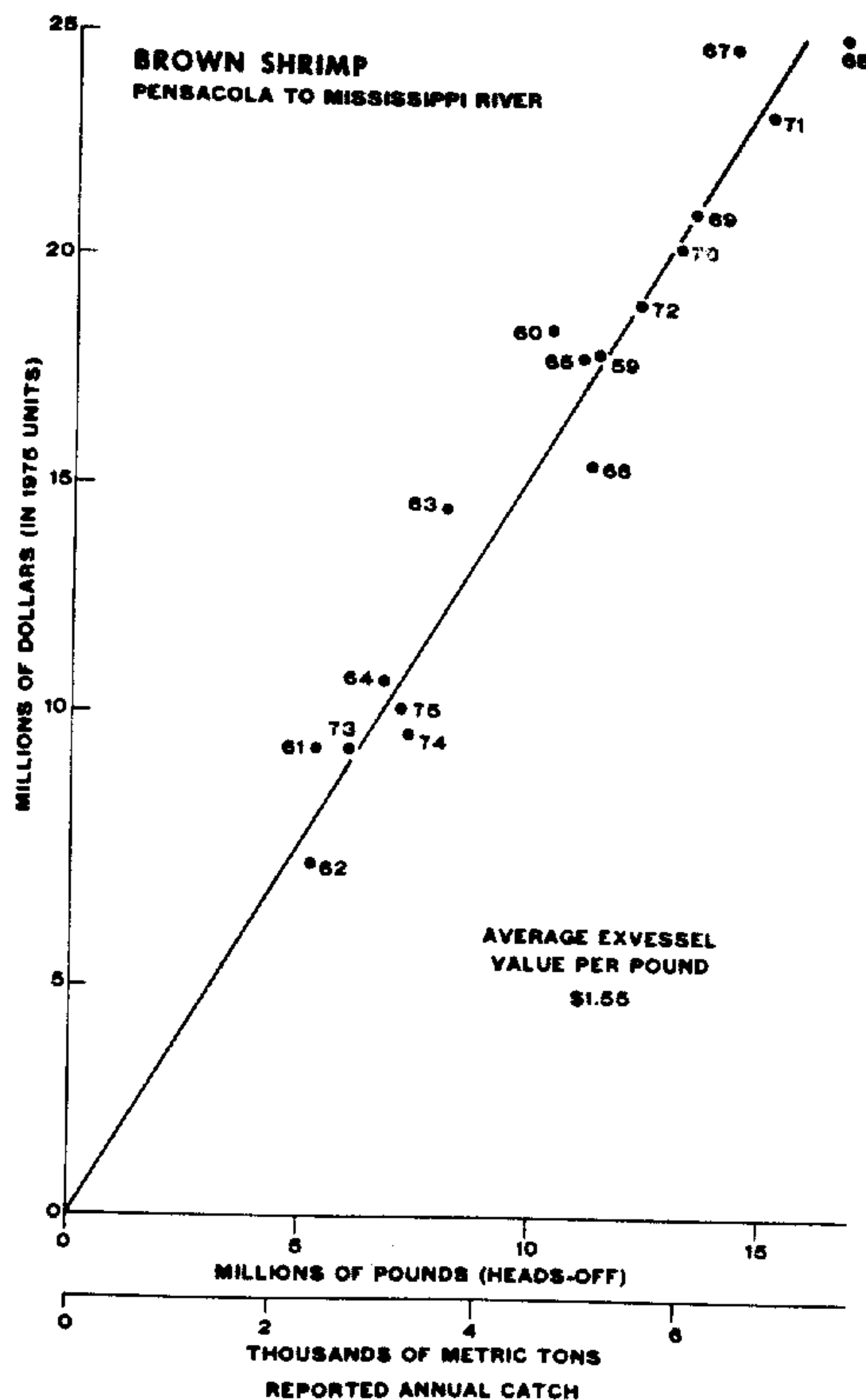


Figure 12.—Relationship between estimated ex-vessel value (millions of dollars in 1975 units) of reported annual catches (millions of pounds or thousands of metric tons, heads-off) of brown shrimp from the Pensacola to Mississippi River region (statistical areas 10-12), 1959-75.

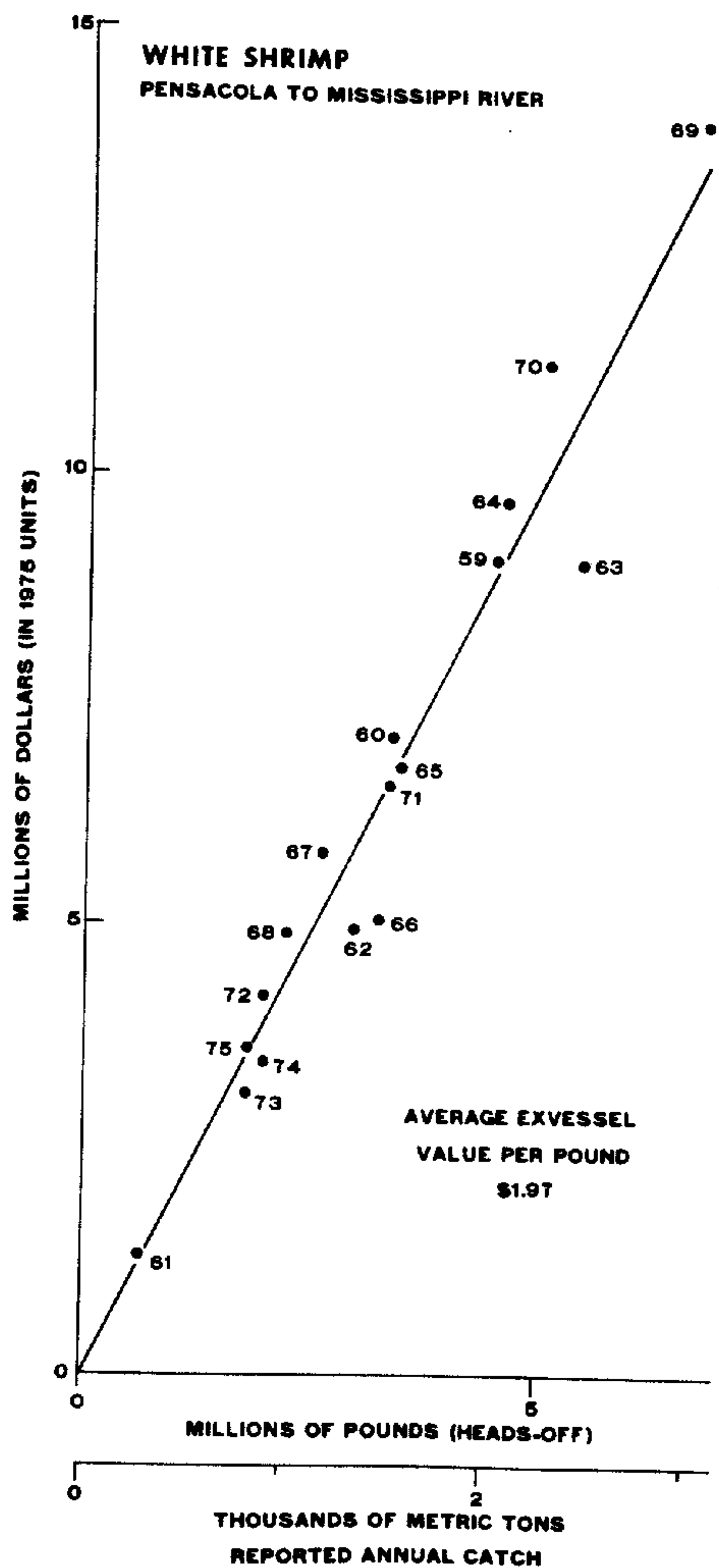


Figure 13.—Relationship between estimated ex-vessel value (millions of dollars in 1975 units) of reported annual catches (millions of pounds or thousands of metric tons, heads-off) of white shrimp from the Pensacola to Mississippi River region (statistical areas 10-12), 1959-75.

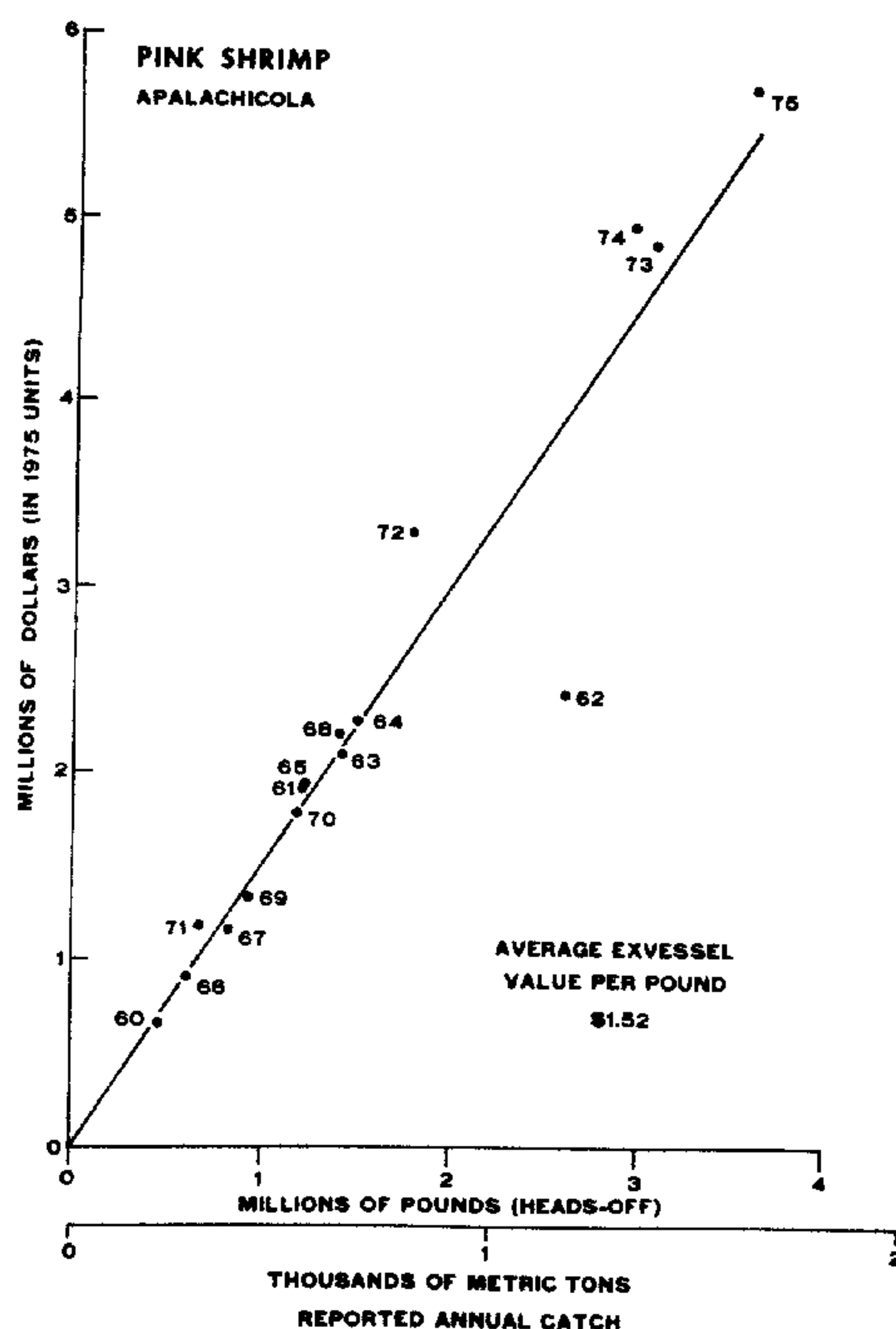


Figure 14.—Relationship between estimated ex-vessel value (millions of dollars in 1975 units) of reported annual catches (millions of pounds or thousands of metric tons, heads-off) of pink shrimp from the Apalachicola region (statistical areas 7-9), 1959-75.

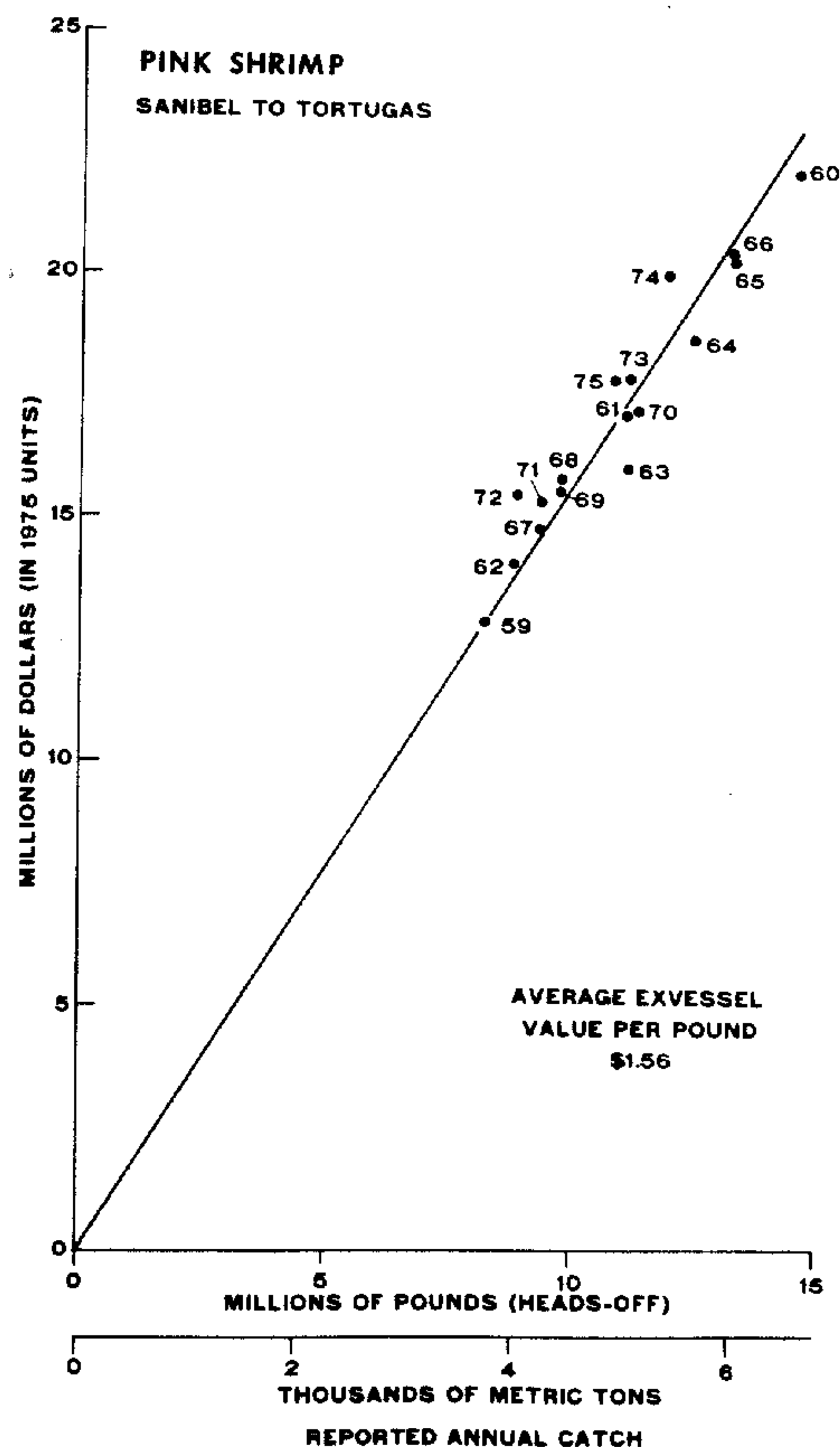


Figure 15.—Relationship between estimated ex-vessel value (millions of dollars in 1975 units) of reported annual catches (millions of pounds or thousands of metric tons, heads-off) of pink shrimp from the Sanibel to Tortugas region (statistical areas 1-6), 1959-75.

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